

IN THE CLAIMS

1. (Currently Amended) A longitudinal magnetic recording medium, comprising:

a non-magnetic substrate;

a plurality of underlayers formed on the non-magnetic substrate; and

a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer comprising:

a lower magnetic layer containing at least ~~one of Ru or~~ Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%, and further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co, and

an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer.

2. (Original) The longitudinal magnetic recording medium according to claim 1, wherein the plurality of the underlayers comprise a non-magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a

body-centered cubic structured second underlayer containing Cr.

3. (Original) The longitudinal magnetic recording medium according to claim 1, wherein the plurality of the underlayers comprise a first underlayer having a B2 structure, and a body-centered cubic structured second underlayer containing Cr.

4. (Original) The longitudinal magnetic recording medium according to claim 1, wherein at least one layer of the plurality of the underlayers is made of a non-magnetic and hexagonal close-packed structured alloy material containing Co.

5. (Original) The longitudinal magnetic recording medium according to claim 4, wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co is formed between the lower magnetic layer and the second underlayer.

6. (Currently Amended) ~~The~~ A longitudinal magnetic recording medium ~~according to claim 4, wherein~~ comprising:
a non-magnetic substrate;

a plurality of underlayers formed on the non-magnetic substrate; and

a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer comprising:

a lower magnetic layer containing at least one of Ru or Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%, and further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co, and

an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer, wherein, at least one layer of the plurality of the underlayers is made of a non-magnetic and hexagonal close-packed structured alloy material containing Co, and

wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co is made of a Co-Ru alloy containing Ru in an amount of not less than 35 at% to not more than 60 at%.

7. (Currently Amended) ~~The~~A longitudinal magnetic recording medium ~~according to claim 5,~~comprising:

a non-magnetic substrate;
a plurality of underlayers formed on the non-magnetic
substrate; and
a magnetic layer formed on the non-magnetic substrate via
the plurality of the underlayers, the magnetic layer
comprising:
a lower magnetic layer containing at least one of Ru or
Re in an amount of not less than 3 at% to not more than 30
at%, and Cr in an amount of not less than 0 at% to not more
than 18 at%, and further containing at least one of B or C
in an amount of not less than 0 at% to not more than 20 at%,
and the balance being made up of Co, and
an upper magnetic layer containing Co as a main
component, anti-ferromagnetically coupled with the lower
magnetic layer via a non-magnetic intermediate layer
wherein,
at least one layer of the plurality of the underlayers is
made of a non-magnetic and hexagonal close-packed structured
alloy material containing Co, and
wherein the underlayer made of the non-magnetic and
hexagonal close-packed structured alloy material containing Co
is formed between the lower magnetic layer and the second
underlayer,

wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co is formed between the magnetic layer and the second underlayer, and the underlayer made of the non-magnetic and hexagonal close-packed structure alloy material containing Co is made of a Co-Ru alloy containing Ru in an amount of not less than 35 at% to not more than 60 at%.

8. (Currently Amended) ~~The~~ A longitudinal magnetic recording medium according to claim 1, comprising:

a non-magnetic substrate;

a plurality of underlayers formed on the non-magnetic substrate;

a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer comprising:

a lower magnetic layer containing at least one of Ru or Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%;

further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co; and

an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer,
wherein the plurality of the underlayers comprises a non-magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a body-centered cubic structured second underlayer containing Cr, and
wherein at least one layer of the plurality of the underlayers is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.

9. (Currently Amended) ~~The A~~ longitudinal magnetic recording medium according to claim 2, comprising:

a non-magnetic substrate;
a plurality of underlayers formed on the non-magnetic substrate;
a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer comprising:
a lower magnetic layer containing at least one of Ru or Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%;

further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co; and

an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer,

wherein the plurality of the underlayers comprise a non-magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a body-centered cubic structured second underlayer containing Cr, and

wherein at least one layer of the plurality of the underlayers is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.

10. (Currently Amended) ~~The~~ A longitudinal magnetic recording medium ~~according to claim 3,~~ comprising:

a non-magnetic substrate;

a plurality of underlayers formed on the non-magnetic substrate;

a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer comprising:

a lower magnetic layer containing at least one of Ru or Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%;

further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co; and

an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer,

wherein the plurality of the underlayers comprise a non-magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a body-centered cubic structured second underlayer containing Cr,

wherein the plurality of the underlayers comprise a first underlayer having a B2 structure, and a body-centered cubic structured second underlayer containing Cr, and

wherein at least one layer of the plurality of the underlayers is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.

11. (Currently Amended) A magnetic storage apparatus, having:

a magnetic recording medium, a driver for driving it in the recording direction, a composite head having an inductive magnetic head for recording and a spin-valve type magnetic head for reading in combination, a means for causing the head to perform relative movement with respect to the medium, and a read / write signal processing means with respect to the head; wherein

the magnetic recording medium, comprising:

a non-magnetic substrate;

a plurality of underlayers formed on the non-magnetic substrate; and

a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer including a lower magnetic layer containing at least ~~one of Ru or Re~~ in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%, and further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co, and an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer, and

the plurality of the underlayers comprising a non-

magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a body-centered cubic structured second underlayer containing Cr.

12. (Original) The magnetic storage apparatus according to claim 11, wherein the plurality of the underlayers of the magnetic recording medium comprise a first underlayer having a B2 structure, and a body-centered cubic structured second underlayer containing Cr.

13. (Original) The magnetic storage apparatus according to claim 11, wherein at least one layer of the plurality of the underlayers of the magnetic recording medium is made of a non-magnetic and hexagonal close-packed structured alloy material containing Co.

14. (Original) The magnetic storage apparatus according to claim 13, wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co of the magnetic recording medium is formed between the lower magnetic layer and the second underlayer.

15. (Currently Amended) ~~The~~^A magnetic storage apparatus according to claim 13, having:

a magnetic recording medium, a driver for driving it in the recording direction, a composite head having an inductive magnetic head for recording and a spin-valve type magnetic head for reading in combination, a means for causing the head to perform relative movement with respect to the medium, and a read / write signal processing means with respect to the head; wherein

the magnetic recording medium, comprising:

a non-magnetic substrate;

a plurality of underlayers formed on the non-magnetic substrate; and

a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer including a lower magnetic layer containing at least one of Ru or Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%, and further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co, and an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer, and

the plurality of the underlayers comprising a non-magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a body-centered cubic structured second underlayer containing Cr, and

wherein at least one layer of the plurality of the underlayers of the magnetic recording medium is made of a non-magnetic and hexagonal close-packed structured alloy material containing Co, and,

wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co of the magnetic recording medium is made of a Co-Ru alloy containing Ru in an amount of not less than 35 at% to not more than 60 at%.

16. (Currently Amended) ~~The~~^A magnetic storage apparatus ~~according to claim 11,~~ having:

a magnetic recording medium, a driver for driving it in the recording direction, a composite head having an inductive magnetic head for recording and a spin-valve type magnetic head for reading in combination, a means for causing the head to perform relative movement with respect to the medium, and a read / write signal processing means with respect to the head; wherein

the magnetic recording medium, comprising:

_____ a non-magnetic substrate;

_____ a plurality of underlayers formed on the non-magnetic substrate; and

_____ a magnetic layer formed on the non-magnetic substrate via the plurality of the underlayers, the magnetic layer including a lower magnetic layer containing at least one of Ru or Re in an amount of not less than 3 at% to not more than 30 at%, and Cr in an amount of not less than 0 at% to not more than 18 at%, and further containing at least one of B or C in an amount of not less than 0 at% to not more than 20 at%, and the balance being made up of Co, and an upper magnetic layer containing Co as a main component, anti-ferromagnetically coupled with the lower magnetic layer via a non-magnetic intermediate layer, and

_____ the plurality of the underlayers comprising a non-magnetic and amorphous structured first underlayer containing Co or Ni as a main component, and a body-centered cubic structured second underlayer containing Cr,

_____ wherein at least one layer of the plurality of the underlayers of the magnetic recording medium is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.

17. (New) A longitudinal magnetic recording medium according to claim 4, wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co is made of a Co-Ru alloy containing Ru in an amount of not less than 35 at% to not more than 60 at%.

18. (New) A longitudinal magnetic recording medium according to claim 5, wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co is made of Co-Ru alloy containing Ru in an amount of not less than 35 at% to not more than 60 at%.

19. (New) A longitudinal magnetic recording medium according to claim 1, wherein at least one layer of the plurality of the underlayers is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.

20. (New) A longitudinal magnetic recording medium according to claim 2, wherein at least one layer of the plurality of the underlayers is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy

contains B in an amount of not less than 2 at% to not more than 15 at%.

21. (New) A longitudinal magnetic recording medium according to claim 3, wherein at least one layer of the plurality of the underlayers is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.

22. (New) The magnetic storage apparatus according to claim 13, wherein the underlayer made of the non-magnetic and hexagonal close-packed structured alloy material containing Co of the magnetic recording medium is made of a Co-Ru alloy containing Ru in an amount of not less than 35 at% to not more than 60 at%.

23. (New) The magnetic storage apparatus according to claim 11, wherein at least one layer of the plurality of the underlayers of the magnetic recording medium is made of a body-centered cubic structured alloy material containing Cr, and the Cr alloy contains B in an amount of not less than 2 at% to not more than 15 at%.